



SEQUENTIAL PROCESSING REACTION VESSEL FOR CHEMICAL FRACTIONATION AND ANALYSIS

CROSS-REFERENCES

- 5 This application is related to co-pending U.S. provisional patent application U.S.S.N. 60/177,837 filed on January 25, 2000 which is incorporated herein by this reference.

FIELD OF THE INVENTION

- 10 This invention relates to devices and methods for sequential fractionation and extraction of elements from complex solid samples. More particularly, this invention relates to a sequential processing reaction vessel and method for accelerated fractionation and extraction of analytes from solid samples which is compatible with microwave heating sources and which reduces processing time and transfer losses, improves extraction efficiency, and provides for accurate total analysis of solid samples.

BACKGROUND OF THE INVENTION

- 15 Sequential extraction methods have been previously developed to address specific questions to enhance understanding of elemental behavior in complex oceanographic and geological samples [see R. Chester et al., *Chemical Geology*, 2: 249-262 (1967); A. Tessler et al., *Analytical Chemistry*, 51(7): 844-850 (1979); D. W. Eggimann et al., *Jour. Sediment Petrol.* 50: 215-225 (1980); J. M. Robbins et al., "A Sequential Extraction Procedure for partitioning elements among co-existing phases in marine sediments", College of Oceanography, Oregon State University, Ref.#84-3, 64pp. (1984); S. B. Moran et al., *Geochimica Cosmochimica Acta*, 55: 2745-2751 (1991); and R. Chester et al., *Journal of the Geological Society, London*, 151: 351-360 (1994)].
- 25 Analytical techniques most commonly used for the chemical fractionation of Si in biogenic and lithogenic sedimentary particles are based on the higher solubility of biogenic silica in alkaline solutions at elevated temperature and pressure. Several variations of this technique require pretreatment of the sample, heating of the sample in the presence of an alkaline solution and the separation of the solution from the remaining particles [see D. W.
- 30 Eggimann et al., *Jour. Sediment Petrol.* 50: 215-225 (1980); P. J. Muller et al., *Deep-sea*

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